Serial #:

UNIVERSITY OF BAHRAIN
COLLEGE OF INFORMATION TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE

ITCS 385 – Database Systems

Midterm
Semester I, 2013-2014

Date: Thursday, November21st, 2013 Time: 3:00pm - 4:30pm

Name	
Student I.D.	
Section	[1] UTH 09:00 – 09:50 (2) UTH 10:00 – 10:50 *Please tick one* [3] UTH 12:00 – 12:50

Question 1 (PART A)	9	9
Question 1 (PART B)	9	8
Question 2	12	10
Question 3	12	11
Question 4	8	8
TOTAL	50	46

Notes:

1. Your answers must be written on the question paper and in the place allocated. Any answer written on any other place will not be marked.
2. Use the back of the pages for any rough work, BUT remember rough work will not be marked.
3. Do not give more than one answer (alternative solutions) to the same question; if you do so then only the first answer will be marked.
4. **Switch off your mobile** and keep it in your pocket or bag.

Question 1
PART A [3 + 3 + 3 = 9 marks]

1. **Define the following terms:**

DBMS: collection of application helps to control and maintain the database.

DBA: ~~Res~~ Database adminstrator, responsible in managing the DB, its security and implementation.

Consider the following database schema for a car insurance company to answer Question (2) & (3):
Employee (ID, name, DepartmentID)
Department (ID, name, building)

2. **Define the term 'Integrity Constraints'? Show two examples of integrity constraints for the company database above.**

[Definition]:
It specify some constraints for the ralationship to prevent invalid operations.

[Examples]:
* Inserting the ID 100 twice at the Employee relationship will break the key constraint
* Inserting the ID of Employee as a string will break the domain constraints.

3. **List two (2) different end users of the company database, to which user category would each belong (explain why)?**

[User 1]:
~~Info~~ Manager, needs to access the database to get different data each time.
Belongs to casual user category

[User 2]:
~~&~~ Employee who takes info from the customer.
~~to~~ Parametric user, because he will use the provided info to access the DB

Question 1
PART B [3+ 6 = 9 marks]

1. **Define the following terms:**

DDL: Data Defintion Language, Used to insert, update, delete and maintain the database by the DBA. - 0,5

Data Independence: The isolation between internal level, conceptual level, and the external view level. How? explain more - 0,5

2. **Briefly explain the centralized and three-tier client/server architectures. Also, for each of the two architectures, give one example of a database system that would be appropriate for.**

Centralized server architectures is some devices connected together to one master device, which means these devices could access the master device to do a certain job. Example: A general printer could be used by all the computers connected to it. OK

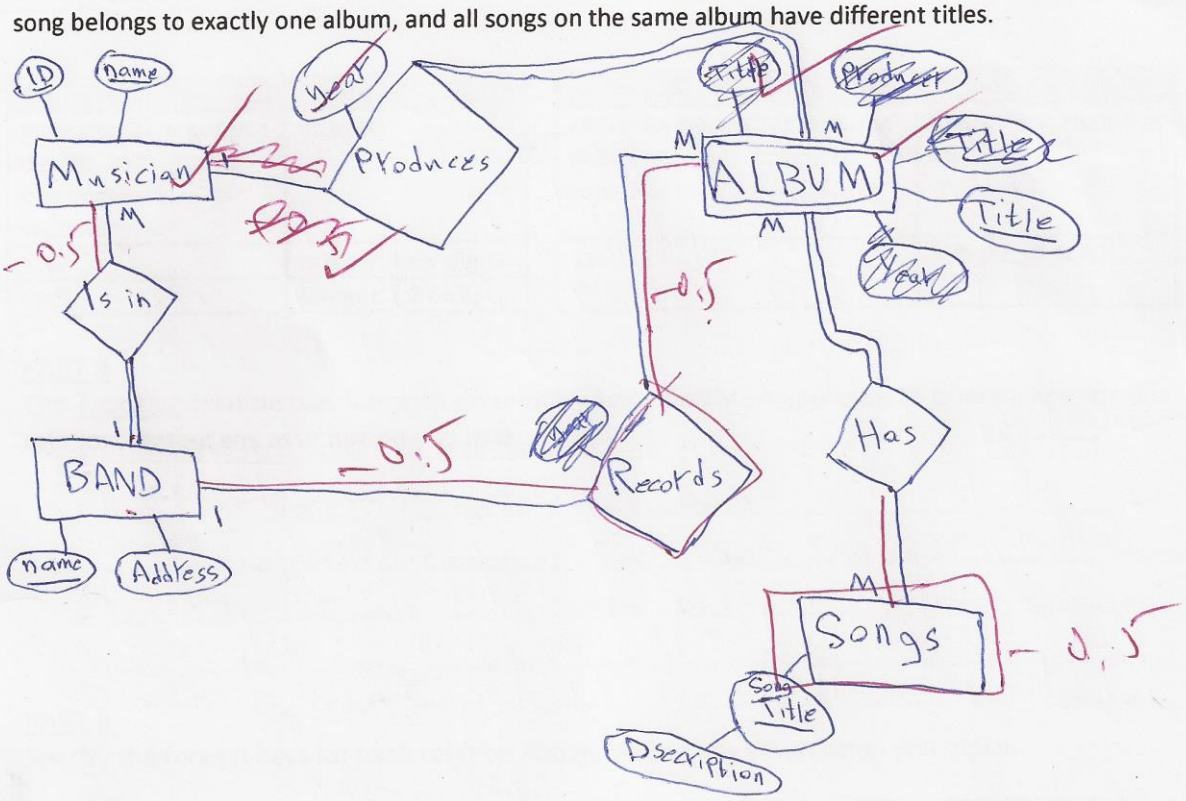
Three-tier architectures is mostly used for web sites. it provides more security for the user and the database records. it is basically a 3 steps process
* User accessing the website to get some data.
* Some data sent to the server by the user.
* Server verify and retrieves info from the database.

Example: Amazon.com

Question 2 [12 marks]

A recording studio needs your help to design its database. The studio stores information about musicians and albums. Draw an ER diagram describing the studio's database for the scenario described below. Note any unspecified requirements, and make appropriate assumptions to make the specification complete.

Each musician who records at the studio has a unique ID and a name, and no two musicians have the same name. Musicians form bands. A band is described by a unique name and has an address. Each band has at least one musician as a member but a musician should be a member of exactly one band. Bands record albums, which have a title and a year of production. Each album is recorded by exactly one band, and no two albums (for the same band) have the same title and the same production year. Each album is produced by exactly one musician. It is not necessary that the producer musician is a member of the recording band. Albums are made up of songs, described by their titles. Naturally, each song belongs to exactly one album, and all songs on the same album have different titles.



10

*Not all albums recorded by bands.
* Musician could produce many albums.
* Not all songs belongs to albums.
* Not all bands record album

Question 3 [3 + 3+ 6 = 12 marks]

5 ✓

Consider the following database state and data definition for a university database. The database keeps track of the university instructors, courses, departments and the courses taught by instructors each semester and each year.

Instructor

instructorID	instructorName	deptID
100	Dr. Adam	51
200	Dr. Jim	31

Course

courseNo	courseName	credits	offeringDeptID
501	Programming I	3	51
301	Database II	4	51
521	Math I	3	31

Teaching

instructorID	courseNo	Sem	Year	sectionNo	roomNo
100	501	1	2012	1	S101
100	501	2	2012	2	S105
200	521	1	2013	3	S104

Department

deptID	deptName	collegeName
51	CS	IT
31	Math	Science

Attribute	Format
instructorID, courseNo deptID, instructorID offeringDeptID, sectionNo	Integer
Year	Integer: four digits.
Sem	Integer: { 1 or 2}

Attribute	Format
courseName, instructorName deptName, collegeName, roomNo	Characters: max size 25
credits	Integer: {3 or 4}

PART A

The *Teaching* relation was left with no primary key. Specify an appropriate primary key for this relation, stating any assumption you make.

~~(InstructorID, CourseNo, SectionNo)~~

(InstructorID, CourseNo, Sem, Year, Section)

-0.5

* Instructor cannot teach ~~two~~ One course with 2 sections having the same number at the same Semester and Year. Therfor, the combination above is minimum & cannot be repeated.

PART B

Specify the foreign keys for each relation above, stating any assumption you make.

Relation	Foreign Key(s)
Instructor	deptID
Course	offeringDeptID
Teaching	InstructorID – CourseNo
Department	N/A ?

-0.5

-0.5

6

PART C

Suppose that each of the following operations is applied directly to the University Database. For each operation, indicate whether this operation will be successful (i.e. will lead to a valid relation state or not), if not, specify the reason(s).

a. `insert into Department values (52, NULL, 'Science');`

Successful operation: (YES / NO)

If NO, WHY

b. `DROP TABLE Teaching;`

Successful operation: (YES / NO)

If NO, WHY

c. `insert into Course values (503, 'Programming III', 2, 50);`

Successful operation: (YES / NO)

If NO, WHY * Number of credits should be 3 or 4 only.
it will beak the domain constraints.

* offeringDeptID is foriegn key from the relation (Department) and so does not exist.
It will violate the refential Key constrants.

Question 4 [3 + 2 + 3 = 8]

Consider the university database in Question (3) to answer the following SQL questions.

1. **Create the *Department* relation.**

```
CReate TABLE Department (
deptID int,
deptName varchar(25),
CollegeName varchar(25),
Primary Key (deptID)
);
```

2. **Change the collegeName from 'IT' to 'Information Technology'.**

```
Update Department
Set collegeName = 'Information Technology'
Where collegeName = 'IT';
```

3. **List the courseNo, sectionNo and roomNo of all courses taught in year 2012 by instructorID=100 in ascending order by courseNo.**

```
SELECT courseNo, SectionNo, roomNo
WHT FROM Teaching
WHERE instructorID=100 AND year=2012
order by courseNo asc;
```